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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHANNES ADRIANUS MARIE VAN BROEKHOVEN and
CAROLUS MATTHIAS ANNA MARIA MESTERS

Appeal 2008-4169
Application 10/786,447
Technology Center 1700

Decided: August 29, 2008

Before EDWARD C. KIMLIN, PETER F. KRATZ, and
KAREN M. HASTINGS, *Administrative Patent Judges*.

KRATZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1-4. We have jurisdiction pursuant to 35 U.S.C. § 6.

Appellants' claimed invention is directed to a gas phase dehydration process for converting 1-phenylethanol into styrene employing a shaped alumina catalyst having a specified pore volume. Claim 1 is illustrative and reproduced below:

1. A process for the preparation of styrene comprising dehydrating gas phase 1-phenylethanol at elevated temperatures in the presence of a dehydration catalyst, in which the dehydration catalyst comprises shaped alumina catalyst particles having a surface area (BET) of from 80 m^2/g to 140 m^2/g and a pore volume of more than 0.65 ml/g.

The Examiner relies on the following prior art references as evidence in rejecting the appealed claims:

Jacques	4,273,735	Jun. 16, 1991
Dirkzwager	WO 99/58480	Nov. 18, 1999

Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Dirkzwager. Claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dirkzwager in view of Jacques.

We affirm the stated rejections for substantially the reasons set forth in the Examiner's Answer and as further explained below.

Appellants do not dispute the Examiner's determination that:

> Dirkzwager discloses a process for the preparation of styrene comprising the dehydration of 1-phenylethanol in the presence of a dehydration catalyst where the catalyst consists of shaped alumina catalyst particles having a surface area (BET) in the range of from 80 to 140 m $^2/g$ and a pore volume (Hg) in the range of 0.35 to 0.65 ml/g (see Dirkzwager, page 3, lines 16-25 …).

Ans. 3.

Moreover, the Examiner maintains that "there is no patentably distinct difference between '0.35 to 0.65 ml/g' and 'more than 0.65 ml/g'" as to the catalyst pore volume as disclosed by Dirkzwager and claimed by Appellants, respectively (Ans. 4).

With regard to this latter point, Appellants contend that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify Dirkzwager's catalyst so as to employ a larger pore volume catalyst; that is, a catalyst with a pore volume of more than 0.65 ml/g (Br. 3). This is allegedly so because there is no teaching or suggestion of such a catalyst by Dirkzwager and Appellants allege that they have demonstrated superior results for the claimed dehydration process using the above-noted catalyst having a higher pore volume than the catalyst taught for the dehydration process disclosed by Dirkzwager. *Id.*

Hence, the dispositive issue before us with regard to the Examiner's first stated rejection is: Have Appellants identified reversible error in the Examiner's obviousness rejection of claim 1 over Dirkzwager based on these contentions? We answer this question in the negative and we affirm the Examiner's obviousness rejection of claim 1 over Dirkzwager.

In considering whether an applicants' claimed invention is obvious or not, we are instructed that "Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734 (2007).

KSR reaffirms the analytical framework set out in *Graham v. John Deere Co.*, 383 U.S. 1 (1966), which states that an objective obviousness analysis includes: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; and (3) resolving the level of ordinary skill in the pertinent art. *KSR*, 127 S. Ct. at 1734. Secondary considerations such as commercial success, long felt but unsolved needs, or failure of others "'might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.'" *Id.* (*quoting Graham*, 383 U.S. at 17-18).

Overlapping ranges disclosed by the prior art for every component in a claim establishes a prima facie case of obviousness. *See In re Geisler,* 116 F.3d 1465, 1469-70 (Fed. Cir. 1997). Indeed, the law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. These cases have consistently held that the Appellants must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

We have no doubt that one of ordinary skill in the art would have readily arrived at the use of a catalyst with a slightly higher pore volume than the pore volume range described for the catalyst used in the styrene production process of Dirkzwager upon routine experimentation given the level of skill of one of ordinary skill in the art and the teachings of Dirkzwager. In this regard, it is well settled that a prima facie case of obvious typically exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have

expected substantially the same results would accrue. *See Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985). *See also Hayes Int'l. Inc. v. Jessup Steel Co.*, 8 F.3d 1573, 1577 n.3 (Fed. Cir. 1993) (When the difference between the claimed invention and the prior art is a range or value of a particular variable, then a *prima facie* rejection is properly established when the difference in range or value is minor).

As for the argued "superior results", the burden rests with Appellants to establish that the results are unexpected, the comparisons are with the closest prior art, and commensurate in scope with the claimed subject matter. *See In re Klosak,* 455 F.2d 1077, 1080 (CCPA 1972). We determine that Appellants have not met this burden. In particular, Appellants have not fairly demonstrated that the claimed process using a catalyst with a pore volume within the range claimed achieves any unexpected result or criticality for the claimed range relative to the prior art dehydration processes conducted with catalysts having a pore volume at the upper end of the disclosed prior art range for reasons stated by the Examiner (Ans. 4). After all, the claimed pore volume range includes pore volumes for the catalyst that are infinitesimally higher than the adjacent upper end of the described prior art range, as correctly found by the Examiner. Indeed, the mere allegation of superior results is hardly a statement urging unexpectedness or criticality for the claimed range.

Moreover and as intimated by the Examiner's discussion of the comparison Examples presented in the Specification (Ans. 4), the results of this comparison are not truly comparable. To be truly comparable, experiments should have only one variable. The experiments described in the Specification present several unfixed variables, including the feedstock

employed, catalyst shape, and BET surface, in addition to the catalyst pore volume for which criticality and/or unexpectedness must be established for the claimed range over the closest prior art (Spec. 7-9). Thus, no true comparison of results is possible. *See In re Dunn,* 349 F.2d 433, 439 (CCPA 1965).

Also, Appellants have not established "improved results", much less unexpected results, for a process conducted under conditions commensurate in scope with the subject matter sought to be patented. *See In re Dill,* 604 F.2d 1356, 1361 (CCPA 1979). For example, Appellants have not satisfactorily explained why the comparison which shows only two examples said to be conducted according to the claimed process is sufficient.

For example, the alleged inventive Examples 1 and 2 were both reported to involve use of a specific tri-lobe shaped catalyst, which catalyst was said to possess a pore volume of 0.77ml/g, a value much higher than the claimed minimum of just greater than 0.65 ml/g, and a specific surface area much narrower than the claimed surface area range (Spec. 7-9). Each of the two tests that were allegedly conducted according to the claimed invention included particularly specified reaction conditions, including temperature, pressure, feed rate, catalyst loading, and reactor type, none of which specific reaction conditions are required by appealed claim 1.

Hence, it can hardly be said that these two exemplified inventive examples establish results that would be expected to be obtained across the entire breadth of the claimed process. In addition, Appellants have not satisfactorily explained how the comparison thereof with the two examples allegedly according to Dirkzwager (WO 99/58480) represents a fair

comparison with the closest prior art given the scope of the claimed subject matter and the number of unfixed variables involved.

Based on the totality of the record, including due consideration of Appellants' evidence and arguments, we determine that the preponderance of evidence weighs most heavily in favor of an obviousness determination. Accordingly, we affirm the Examiner's obviousness rejection of claim 1 over Dirkzwager.

As for the Examiner's separate obviousness rejection of claims 1-4 over Dirkzwager taken together with Jacques, we note that Appellants argue the rejected claims together as a group. Thus, we select claim 1 as representative of these rejected claims.

It follows that for the reasons stated above, Dirkzwager alone renders the claimed subject mater of representative claim 1 obvious within the meaning of 35 U.S.C. § 103(a).

In addition, we note that the undisputed findings of the Examiner with respect to the additional teachings of Jacques concerning the known availability of alumina dehydration catalysts having a pore volume of from 0.3 to 2.8 cubic centimeters per gram bolsters this obviousness assessment of the Examiner.[1] In this regard, we further agree with the Examiner's position as to why Jacques together with Dirkzwager would have further suggested to one of ordinary skill in the art the obviousness of employing higher pore volume catalysts in Dirkzwager's dehydration process (Ans. 3). Also, we agree with the Examiner's rebuttal to Appellants' argument in opposition

[1] Appellants do not argue that the claimed ml/g units for the pore volume lack correspondence with the cubic centimeters per gram units of Jacques.

thereto (Ans.4-5). Accordingly, we will not burden the record with a further discussion of the Examiner's second stated obviousness rejection.

It follows that we sustain all grounds of rejection presented in this appeal for the reasons stated in the Answer and above.

CONCLUSION

The decision of the Examiner to reject claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Dirkzwager; and to reject claims 1-4 under 35 U.S.C. § 103(a) as being unpatentable over Dirkzwager in view of Jacques is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

sld/cam

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